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SAFETY AND HEALTH TOPICS

Hydrogen Sulfide

Hazards

Health Hazards

Hydrogen sulfide gas causes a wide range of health effects. Workers are primarily exposed to hydrogen sulfide by breathing it. The effects depend on how much hydrogen sulfide you breathe and for how long. Exposure to very high concentrations can quickly lead to death.

Short-term (also called acute) symptoms and effects are shown below:

<div>Worker Exposure Limits</div> <div>NIOSH REL (10-min. ceiling): 10 ppm</div> <div>OSHA PELs: General Industry Ceiling Limit: 20 ppm General Industry Peak Limit: 50 ppm (up to 10 minutes if no other exposure during shift) Construction 8-hour Limit: 10 ppm Shipyard 8-hour limit: 10 ppm</div> <div>NIOSH IDLH: 100 ppm</div> <div>IDLH: immediately dangerous to life and health (level that interferes with the ability to escape) (NIOSH)</div> <div>PEL: permissible exposure limit (enforceable) (OSHA)</div> <div>ppm: parts per million</div> <div>REL: recommended exposure limit (NIOSH)</div>	Concentration (ppm)	Symptoms/Effects
	0.00011-0.00033	Typical background concentrations
	0.01-1.5	Odor threshold (when rotten egg smell is first noticeable to some). Odor becomes more offensive at 3-5 ppm. Above 30 ppm, odor described as sweet or sickeningly sweet.
	2-5	Prolonged exposure may cause nausea, tearing of the eyes, headaches or loss of sleep. Airway problems (bronchial constriction) in some asthma patients.
	20	Possible fatigue, loss of appetite, headache, irritability, poor memory, dizziness.
	50-100	Slight conjunctivitis ("gas eye") and respiratory tract irritation after 1 hour. May cause digestive upset and loss of appetite.
	100	Coughing, eye irritation, loss of smell after 2-15 minutes (olfactory fatigue). Altered breathing, drowsiness after 15-30 minutes. Throat irritation after 1 hour. Gradual increase in severity of symptoms over several hours. Death may occur after 48 hours.
	100-150	Loss of smell (olfactory fatigue or paralysis).
	200-300	Marked conjunctivitis and respiratory tract irritation after 1 hour. Pulmonary edema may occur from prolonged exposure.
	500-700	Staggering, collapse in 5 minutes. Serious damage to the eyes in 30 minutes. Death after 30-60 minutes.
	700-1000	Rapid unconsciousness, "knockdown" or immediate collapse within 1 to 2 breaths, breathing stops, death within minutes.

1000-2000

Nearly instant death

What about longer term health effects? Some people who breathed in levels of hydrogen sulfide high enough to become unconscious continue to have headaches and poor attention span, memory, and motor function after waking up. Problems with the cardiovascular system have also been reported at exposures above permissible exposure limits. People who have asthma may be more sensitive to hydrogen sulfide exposure. That is, they may have difficulty breathing at levels lower than people without asthma.

Safety Hazards

- Hydrogen sulfide is a highly flammable, explosive gas, and can cause possible life-threatening situations if not properly handled. In addition, hydrogen sulfide gas burns and produces other toxic vapors and gases, such as sulfur dioxide.
- In addition to exposure to hydrogen sulfide in the air, exposure to liquid hydrogen sulfide can cause "blue skin" or frostbite. If clothing becomes wet, avoid ignition sources, remove the clothing and isolate it in a safe area to allow it to evaporate.
- The effect called knockdown (rapid unconsciousness) often results in falls that can seriously injure the worker.

The explosive range of hydrogen sulfide in air is 4.5 to 45.5 percent. This range is much higher than the PEL.

The following resources provide more information on the safety and health effects of hydrogen sulfide:

- Hydrogen Sulfide (H₂S)*. OSHA Fact Sheet. (October 2005). Provides a concise list of industrial sources, symptoms and health effects of exposure to hydrogen sulfide, and OSHA requirements for the protection of workers.
- Hydrogen Sulfide (H₂S) (PDF). OSHA QuickCard™. Provides the important safety precautions for hydrogen sulfide.
- Hydrogen Sulfide. National Institute for Occupational Safety and Health (NIOSH) Workplace Safety and Health Topic. Provides a listing of NIOSH and related resources on hydrogen sulfide.
- NIOSH Pocket Guide to Chemical Hazards. National Institute for Occupational Safety and Health (NIOSH) Publication No. 2005-149. Provides physical descriptions, exposure limits, measurement methods, personal protection and sanitation, first aid, respirator recommendations, exposure routes, symptoms, target organs, and other information about hydrogen sulfide.
- IDLH Documentation for Hydrogen Sulfide. National Institute for Occupational Safety and Health (NIOSH), (Revised August 16, 1996). Describes how NIOSH determined hydrogen sulfide Immediately Dangerous to Life and Health (IDLH).
- ToxFAQs for Hydrogen Sulfide. Agency for Toxic Substances and Disease Registry (ATSDR), (July 2006). Answers the most frequently asked health questions about hydrogen sulfide.
- Toxicological Profile for Hydrogen Sulfide. Agency for Toxic Substances and Disease Registry (ATSDR), (July 2006). More detailed technical information on hydrogen sulfide, health effects, chemical and physical properties, potential for human exposure, and analytical methods.
- Medical Management Guidelines for Hydrogen Sulfide. Agency for Toxic Substances and Disease Registry (ATSDR), (April 2006). Provides general information about hydrogen sulfide, its health effects, and specific medical treatments for hydrogen sulfide exposure.

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